<110> CONNAUGHT LABORATORIES LIMITED
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<120> RECOMBINANT HIGH MOLECULAR WEIGHT MAJOR OUTER MEMBRANE PROTEIN OF MORAXELLA

<130> 1038-1063 MIS

<140> PCT/CA00/00870
<141> 2000-07-26

<150> 09/361,619
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<170> PatentIn Ver. 2.1

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Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr
    130                 135                 140

Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met
145                 150                 155                 160

Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr
                165                 170                 175

Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu
            180                 185                 190

Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu
        195                 200                 205

Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser
    210                 215                 220

Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser
225                 230                 235                 240

Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln
                245                 250                 255

Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser
            260                 265                 270

Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp
        275                 280                 285
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Ala Val Asn Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu
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Arg Arg Ile Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile
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Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala
                325                 330                 335

Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly
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Leu Lys Val Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn
        355                 360                 365

Thr Thr Thr Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser
    370                 375                 380

Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro
385                 390                 395                 400

Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly
                405                 410                 415

Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr
            420                 425                 430

Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp
        435                 440                 445

Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser
    450                 455                 460

Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile
465                 470                 475                 480

Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu
                485                 490                 495

Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser
            500                 505                 510

Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr
        515                 520                 525

Ala Pro Thr Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp
    530                 535                 540

Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser
545                 550                 555                 560

Leu Val Thr Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg
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Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp
            580                 585                 590

Asp Asp Ala Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala
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Gly Ala Val Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val
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Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser
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Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val
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Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe
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Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala
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Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val
690 695 700

Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn
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Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr
725 730 735

Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn
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Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala
755 760 765

Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn
770 775 780

Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn
785 790 795 800

Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr
805 810 815

Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu
820 825 830

Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu
835 840 845

Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn
850 855 860

Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn
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Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp
885 890 895

Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn
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Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn
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Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys
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Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly
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Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys
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Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys
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Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly
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Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly
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Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala
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Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn
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Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu
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Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu
1075 1080 1085

His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser
1090 1095 1100

Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr
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Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val
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Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr
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Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly
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Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn
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Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp
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Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly
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Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr
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Asp Thr Val Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr
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Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val
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Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr
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Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser
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His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser
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Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val
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Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly
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Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln
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Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val
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Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn
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Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn
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Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala
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Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys
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Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys
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Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr
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Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly
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Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly
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Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu
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Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp
          1540                1545                1550

Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu
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Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala
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Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val
1585                1590                1595                1600

Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu
              1605                1610                1615

Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn
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Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn
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Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln
1665 1670 1675 1680

Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val
1685 1690 1695

Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val
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Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile
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Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn
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Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys
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Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu
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Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr
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His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr
1825 1830 1835 1840

Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr
1845 1850 1855

Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile
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Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val
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Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala
1905 1910 1915 1920

Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile
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Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln
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Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp
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Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg
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Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser
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Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln
65                  70                  75                  80

Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala
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Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala
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Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile
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Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val
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Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His
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Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile
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Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser
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Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala
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Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn
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Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val
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Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser
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Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr
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Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val
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Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln
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Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro
305 310 315 320

Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly
325 330 335

Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala
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Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp
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Asn Ser Thr Asp Val Lys Ile Gly Leu Asp Asn Thr Leu Thr Ile Lys
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Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp Asn Asn Ile Gly Val Val
385 390 395 400

Lys Glu Ala Asp Asn Ser Gly Leu Lys Val Lys Leu Ala Lys Thr Leu
405 410 415

Asn Asn Leu Thr Glu Val Asn Thr Thr Thr Leu Asn Ala Thr Thr Thr
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Val Lys Val Gly Ser Ser Ser Ser Thr Thr Ala Glu Leu Leu Ser Asp
435 440 445

Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly Ser Gln Ser Thr Ser Lys
450 455 460

Thr Val Tyr Gly Val Asn Gly Val Lys Phe Thr Asn Asn Ala Glu Thr
465 470 475 480

Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr Arg Asp Lys Ile Gly Phe
485 490 495

Ala Arg Asp Gly Asp Val Asp Glu Lys Gln Ala Pro Tyr Leu Asp Lys
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Lys Gln Leu Lys Val Gly Ser Val Ala Ile Thr Ile Asp Asn Gly Ile
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Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu Ala Lys Gly Ser Ser Ala
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Asn Ala Gly Ala Gly Ile Ser Val Thr Pro Thr Glu Ile Ser Val Asp
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Ala Lys Ser Gly Asn Val Thr Ala Pro Thr Tyr Asn Ile Gly Val Lys
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Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser Asp Lys Phe Ser Val Lys

595 600 605

Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser
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Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp Ser Ala Leu Gln Ser Phe
625 630 635 640

Thr Val Lys Glu Glu Asp Asp Asp Asp Ala Asn Ala Ile Thr Val Ala
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Lys Asp Thr Thr Lys Asn Ala Gly Ala Val Ser Ile Leu Lys Leu Lys
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Gly Lys Asn Gly Leu Thr Val Ala Thr Lys Lys Asp Gly Thr Val Thr
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Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr Ile Gly Lys Ser Thr Leu
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Asn Asn Asp Gly Leu Thr Val Lys Asp Thr Asn Glu Gln Ile Gln Val
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Gly Ala Asn Gly Ile Lys Phe Thr Asn Val Asn Gly Ser Asn Pro Gly
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Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe
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Ala Gly Ser Asp Gly Ala Val Asp Thr Asn Lys Pro Tyr Leu Asp Gln
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Asp Lys Leu Gln Val Gly Asn Val Lys Ile Thr Asn Thr Gly Ile Asn
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Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser Pro Thr Leu Pro Ser Ile
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Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu Gly Asn Thr Ile Gln Asp
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Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn Asp Ile Leu Asn Thr Gly
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Phe Asn Leu Lys Asn Asn Asn Asn Pro Ile Asp Phe Val Ser Thr Tyr
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Asp Ile Val Asp Phe Ala Asn Gly Asn Ala Thr Thr Ala Thr Val Thr
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His Asp Thr Ala Asn Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val
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Asp Asp Thr Thr Ile His Leu Thr Gly Thr Asp Asp Asn Lys Lys Leu
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Gly Val Lys Thr Thr Lys Leu Asn Lys Thr Ser Ala Asn Gly Asn Thr
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Ala Thr Asn Phe Asn Val Asn Ser Ser Asp Glu Asp Ala Leu Val Asn
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Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His

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Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Thr Val Lys
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Lys Val Asp Glu Asn Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val
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Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly
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Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe
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Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn
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Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln
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Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile
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Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu
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Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys Ile Thr Asn Ile Gln
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Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys
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Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala
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Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln
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Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser
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Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr
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Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn
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Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys
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Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr
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Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala
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Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu Thr Phe Ala Gly Asp
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Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala Lys Asp Leu Thr Asn
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Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile Asp Asp Lys Gly Val
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Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala Asn Thr Pro Val Leu
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Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val Ile Ser Asn Val Gly
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Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu

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Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly
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Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly
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Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr Gly Gly Ile Gln Val
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Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp
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Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr
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Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser
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Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn
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Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly
1845 1850 1855

Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn
1860 1865 1870

Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser
1875 1880 1885

Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala Gly Ala Thr Gly Thr Val
1890 1895 1900

Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala
1905 1910 1915 1920

Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser
1925 1930 1935

Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr

1940 1945 1950

Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp His Arg Ile His Gln
1955 1960 1965

Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala
1970 1975 1980

Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly
1985 1990 1995 2000

Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys
2005 2010 2015

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Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser

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Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp Ser Ala Leu Gln Ser Phe
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Thr Val Lys Glu Glu Asp Asp Asp Asp Ala Asn Ala Ile Thr Val Ala
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Lys Asp Thr Thr Lys Asn Ala Gly Ala Val Ser Ile Leu Lys Leu Lys
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Gly Lys Asn Gly Leu Thr Val Ala Thr Lys Lys Asp Gly Thr Val Thr
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Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr Ile Gly Lys Ser Thr Leu
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Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe
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Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr
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Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn
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Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn
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Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser
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Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala Gly Ala Thr Gly Thr Val
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Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala
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Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys
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Tyr Leu Pro Lys Asn Leu Asp Leu Lys Asn Glu Phe His Lys Leu Ile
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His Gly His Glu Ile Leu Lys Lys Ile Gln Thr Ser Thr Asp Gly Lys
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Ile Lys Tyr Arg Arg Thr Arg Ala Gln Gly His Ala Ser Thr Ala Val
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Tyr Ala Thr Ala Glu Ala Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala
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Gln Ala Thr Lys Gln Ser Ser Ile Ala Val Gly Ser Asn Ala Lys Ala
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Leu Lys Leu Val Glu Glu Leu Ala Asn Arg Lys Ile Thr Phe Lys Gly
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Glu Thr Ala Asp Ser Ala Leu Pro Ser Phe Lys Val Gln Asn Gly Asp
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Leu Val Ile Glu Gln Val Pro Ser Ala Asp Gly Asn Ser Thr Lys Asn
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Ile Lys Leu Thr Glu Thr Ser Thr Asn Gly Asn Ala Thr Thr Phe Ser
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Thr Asp Asp Asp His Ala Leu Val Lys Ala Ser Asp Ile Ala Gly Asn
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Leu Asn Thr Leu Ala Glu Glu Ile His Thr Thr Lys Gly Thr Ala Asn
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Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala
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Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Lys Asn
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Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu
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Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu
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His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser
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Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr
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Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val
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Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr
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Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asn Ser Gln Asn Gly
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Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn
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Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly
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Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr
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Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn
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Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly
1875 1880 1885

Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala
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Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser
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Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu
1955 1960 1965

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Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys
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Ala Tyr Ala Gln Asn Asn Ser Lys Ile Ala Phe Gly Thr Thr Gly Asn
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Leu Ala Lys Ala His Ala Asn Gln Ala Ile Ala Ile Gly Gly Ser Lys
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Pro Asp Pro Arg Asn Gln Ala Ala Asn Gln Lys Ala Gly Ser His Ala
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915 920 925

Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys
930 935 940

Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly

945 950 955 960

Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys
965 970 975

Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys
980 985 990

Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly
995 1000 1005

Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly
1010 1015 1020

Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala
1025 1030 1035 1040

Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn
1045 1050 1055

Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu
1060 1065 1070

Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu
1075 1080 1085

His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser
1090 1095 1100

Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr
1105 1110 1115 1120

Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val
1125 1130 1135

Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr
1140 1145 1150

Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly
1155 1160 1165

Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn
1170 1175 1180

Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp
1185 1190 1195 1200

Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly
1205 1210 1215

Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr
1220 1225 1230

Asp Thr Val Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr
1235 1240 1245

Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val
1250 1255 1260

Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr
1265 1270 1275 1280

Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser

1285 1290 1295

Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala
1300 1305 1310

His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser
1315 1320 1325

Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val
1330 1335 1340

Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly
1345 1350 1355 1360

Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln
1365 1370 1375

Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val
1380 1385 1390

Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn
1395 1400 1405

Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn
1410 1415 1420

Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala
1425 1430 1435 1440

Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys
1445 1450 1455

Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys
1460 1465 1470

Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr
1475 1480 1485

Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly
1490 1495 1500

Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly
1505 1510 1515 1520

Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu
1525 1530 1535

Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp
1540 1545 1550

Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu
1555 1560 1565

Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala
1570 1575 1580

Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val
1585 1590 1595 1600

Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu
1605 1610 1615

Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn

1620 1625 1630

Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly
1635 1640 1645

Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn
1650 1655 1660

Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln
1665 1670 1675 1680

Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val
1685 1690 1695

Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val
1700 1705 1710

Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile
1715 1720 1725

Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn
1730 1735 1740

Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val
1745 1750 1755 1760

Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys
1765 1770 1775

Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala
1780 1785 1790

Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu
1795 1800 1805

Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr
1810 1815 1820

His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr
1825 1830 1835 1840

Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr
1845 1850 1855

Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile
1860 1865 1870

Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val
1875 1880 1885

Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr
1890 1895 1900

Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala
1905 1910 1915 1920

Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile
1925 1930 1935

Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln
1940 1945 1950

Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp

1955 1960 1965

Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala
1970 1975 1980

Ala Val Gly Ala Gly Phe His Phe
1985 1990

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<400> 16
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catcagaggt ctttgaggtg tcat 24

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gatgtcggca atgtttacct ga 22

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<400> 33
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<210> 34
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<400> 34
His Tyr Ala Val Val Lys
1 5

<210> 35
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<400> 35
His Tyr Val Gly Gly Lys
1 5

<210> 36
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His Tyr Gln Gly Gly Lys
1 5

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<400> 37
His Tyr Phe Gly Gly Lys
1 5

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Gly Val Val Lys
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<400> 39
Val Leu Gly Gly Lys
1 5

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<400> 40
Val Val Ala Gly Lys
1 5

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ccggctgcag ctattactta cctgctacca cattgcctgt acc 43

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<400> 44
Gly Thr Gly Asn Val Val Ala Gly Lys
1 5

<210> 45
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gatggcgtga agtttgccaa ggttaataat aatggtgttg taggtgctgg cattgatggc 180
acaactcgca ttaccagaga tgaaattggc tttactggga ctaatggctc acttgataaa 240
agcaaacccc acctaagcaa agacggcatt aacgcaggtg gtaaaaagat taccaacatt 300
caatcaggtg agattgccca aaacagccat gatgctgtga caggcggcaa gatttatgat 360
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cacgaattct cagtagcaga tgaacaaggt aataacttta cggttagtaa cccttactcc 480
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accaaggtaa ataaaggtgt ggtgcgtgtg ggcattgacc aaaccaaagg cttaaccacg 600
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caaaatacca tcacaggact aagcaacact ctagctaatg ttaccaatga taaaggtagc 720
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cacaacggtc aaggtgcggt ggcagtggga ctgtcgaagc tgtcggataa tggtcaatgg 3060
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<211> 1044
<212> PRT
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1 5 10 15

Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly
20 25 30

Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val
35 40 45

Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile
50 55 60

Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys

65 70 75 80

Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys
85 90 95

Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala
100 105 110

Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys
115 120 125

Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser
130 135 140

Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser
145 150 155 160

Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu
165 170 175

Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly Ile
180 185 190

Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn
195 200 205

Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile
210 215 220

Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser
225 230 235 240

Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr
245 250 255

Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln
260 265 270

Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn
275 280 285

Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr
290 295 300

Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr
305 310 315 320

Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr
325 330 335

Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr
340 345 350

Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr
355 360 365

Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn
370 375 380

Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser
385 390 395 400

Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys

405 410 415

Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro
420 425 430

Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu
435 440 445

Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala
450 455 460

Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn
465 470 475 480

Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu
485 490 495

Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr
500 505 510

Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn
515 520 525

Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala
530 535 540

Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile
545 550 555 560

Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala
565 570 575

Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val
580 585 590

Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val
595 600 605

Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly
610 615 620

Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys
625 630 635 640

Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly
645 650 655

Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr
660 665 670

Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp
675 680 685

Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala
690 695 700

Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn
705 710 715 720

Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe
725 730 735

Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn

740 745 750

Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe
755 760 765

Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr
770 775 780

Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr
785 790 795 800

Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys
805 810 815

His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser
820 825 830

Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp
835 840 845

Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val
850 855 860

Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr
865 870 875 880

Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala Gly
885 890 895

Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala
900 905 910

Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala
915 920 925

Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln
930 935 940

Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp
945 950 955 960

His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser
965 970 975

Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser
980 985 990

Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala
995 1000 1005

Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys Ile
1010 1015 1020

Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala Ala Val Gly Ala
1025 1030 1035 1040

Gly Phe His Phe

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<212> DNA

<213> Moraxella catarrhalis

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gatggcgtga agtttgccaa ggttaataat aatggtgttg taggtgctgg cattgatggc 180
acaactcgca ttaccagaga tgaaattggc tttactggga ctaatggctc acttgataaa 240
agcaaacccc acctaagcaa agacggcatt aacgcaggtg gtaaaaagat taccaacatt 300
caatcaggtg agattgccca aaacagccat gatgctgtga caggcggcaa gatttatgat 360
ttaaaaaccg aacttgaaaa caaaatcagc agtactgcca aaacagcaca aaactcatta 420
cacgaattct cagtagcaga tgaacaaggt aataacttta cggttagtaa cccttactcc 480
agttatgaca cctcaaagac ctctgatgtc atcacctttg caggtgaaaa cggcattacc 540
accaaggtaa ataaaggtgt ggtgcgtgtg ggcattgacc aaaccaaagg cttaaccacg 600
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<211> 816
<212> PRT
<213> Moraxella catarrhalis

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Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly
20 25 30

Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val
35 40 45

Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile
50 55 60

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Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys
 65                  70                  75                  80

Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys
                 85                  90                  95

Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala
            100                 105                 110

Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys
        115                 120                 125

Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser
    130                 135                 140

Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser
145                 150                 155                 160

Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu
                165                 170                 175

Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly Ile
            180                 185                 190

Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn
        195                 200                 205

Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile
    210                 215                 220

Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser
225                 230                 235                 240

Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr
                245                 250                 255

Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln
            260                 265                 270

Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn
        275                 280                 285

Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr
    290                 295                 300

Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr
305                 310                 315                 320

Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr
                325                 330                 335

Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr
            340                 345                 350

Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr
        355                 360                 365

Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn
    370                 375                 380

Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser
385                 390                 395                 400
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Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys
405 410 415

Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro
420 425 430

Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu
435 440 445

Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala
450 455 460

Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn
465 470 475 480

Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu
485 490 495

Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr
500 505 510

Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn
515 520 525

Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala
530 535 540

Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile
545 550 555 560

Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala
565 570 575

Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val
580 585 590

Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val
595 600 605

Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly
610 615 620

Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys
625 630 635 640

Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly
645 650 655

Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr
660 665 670

Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp
675 680 685

Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala
690 695 700

Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn
705 710 715 720

Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe
725 730 735

Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn
740 745 750

Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe
755 760 765

Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr
770 775 780

Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr
785 790 795 800

Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys
805 810 815

<210> 49
<211> 720
<212> DNA
<213> Moraxella catarrhalis

<400> 49
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aatactgttg ccatcattac cataatttag taacgcattt agtaacgcat ttgtaaaaat 180
cattgcgccc ctttatgtgt atcatatgaa tagaatatta tgattgtatc tgattattgt 240
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atttgatata ttttgaaact aatctattga cttaaatcac catatggtta taatttagca 360
taatggtagg ctttttgtaa aaatcacatc gcaatattgt tctactgtta ctaccatgct 420
tgaatgacga tcccaatcac cagattcatt caagtgatgt gtttgtatac gcaccattta 480
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catgaatcac atctataaag tcatctttaa caaagccaca ggcacattta tggcagtggc 600
agagtacgcc aaatcccaca gcacgggggg gggtagctgt gctacagggc aagttggcag 660
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<210> 50
<211> 60
<212> PRT
<213> Moraxella catarrhalis

<400> 50
Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe
1 5 10 15

Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Gly Ser
20 25 30

Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg
35 40 45

Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr
50 55 60

<210> 51
<211> 5
<212> PRT
<213> Moraxella cattarhalis

<400> 51
Val Val Ala Gly Lys

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